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To Christopher Lichens/R9/USEPA/US@EPA
cc Tom.Perina@CH2M.com, Richard.Braun@CH2M.com
bcc
Subject Omega Chemical-Draft Review Comments on EE/CA

Here are the draft review comments. The 3rd attachment is a plot that Tom prepared for one of his review comments.

Tom will be reviewing these comments concurrently.

Regards,

Mike

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Alt1_Q.pdf

***Review Comments on Draft Engineering Evaluation
and Cost Analysis, Omega Chemical Superfund Site,
April 29, 2005***

TO: Christopher Lichens/USEPA Region IX

FROM: Tom Perina/CH2M HILL, Riverside
Mike Grigorieff/CH2M HILL, Santa Ana
Richard Braun/CH2M HILL, Santa Ana

DATE: May 9, 2005

As you requested, CH2M HILL reviewed the document prepared by Camp Dresser & McKee, Inc. (CDM), dated April 29, 2005, titled *Draft Engineering Evaluation and Cost Analysis, Omega Chemical Superfund Site*. CDM prepared the subject document on behalf of the Omega Chemical Site PRP Organized Group (OPOG).

Consistent with the oversight role of the U.S. Environmental Protection Agency (EPA), this technical memorandum presents recommendations that CH2M HILL believes will streamline and improve the project. The goal of this review is to confirm that the approach to the investigation is appropriate and consistent with the goals at this site and is consistent with typical industry practices.

This review lists comments sequentially as noted in the document. Editing-level issues are not addressed in this review.

General Comments

1. The annotated outline of the Engineering Evaluation and Cost Analysis (EECA) dated March 11, 2003 (prepared in March 2005) included downgradient re-injection and in-situ chemical oxidation (ISCO) under Alternative 3. The Draft EECA does not include either. The review agrees that ISCO would likely be screened out, as indicated in the outline. However, the downgradient re-injection with or without enhanced anaerobic biodegradation (EAB) should be considered.
2. The outline stated that extraction wells under Alternative 1 would be placed in locations of greatest contaminant concentrations. The area targeted in the EECA is along the southwest boundary of the former Omega Chemical property. High contaminant concentrations are expected underneath most of the former Omega property, therefore other well locations should be considered.
3. A combination of Alternative 1 and Alternative 2 (or 3) should be considered. The source area extraction may be implemented later, concurrently with on-site soil treatment. Because the presumptive soil remedy is soil vapor extraction (SVE), the two extraction systems will be enhanced when operating simultaneously on dual-phase

extraction wells. The SVE will increase groundwater extraction rates and groundwater extraction will depress the water table and expose the soils to SVE. Combining the two systems can achieve cost savings compared to the installation of separate treatment systems for soil and groundwater.

Specific Comments

4. Executive Summary: The second paragraph states that EE/CA evaluates alternatives aimed at removing contamination and reducing the associated risks. However, the two Remedial Action Objectives (RAOs) listed for this EE/CA identify 1) horizontal and vertical containment of groundwater contamination associated with the Omega property and 2) meeting air and water treatment standards...These two goals some inconsistent with the earlier stated alternatives focus of removing contamination.
5. Section 1.3.2: The section should mention refrigerants among the chemicals recycled at the site. Also, it would be very helpful if a summary diagram(s) was included showing where the 11 treatment units and tankage where located at the facility in 1990 from the Operations Plan since the rationale for extraction well placement is related to this historical information.
6. Sections 2.1-2.3: Include a figure showing adjacent properties, streets, etc. discussed in the text.
7. Section 2.8, 2nd par., last sentence: Insert "main" before "compounds of concern."
8. Section 2.8, 4th par.: 1,4-dioxane was also detected in OW1.
9. Section 2.9, Streamlined Risk Evaluation. The comments on Appendix B, "Stepwise Human Health Risk Ratio Calculations", may require changes to Section 2.9, as appropriate. It is recommended that the results and conclusions of the human health risk and hazards estimations calculated in Appendix B be summarized in Section 2.9.
10. Section 2.9.1: Provide the source of information for the statement regarding no plans for residential development.
11. Section 2.9.1.4: Construction workers may be exposed to the risk of inhalation of contaminant vapors in ambient air during work in excavations at the site. Such a scenario may occur during removal action.
12. Section 4.1.1, App. D: Provide the rationale for placing all extraction wells on the southwestern border of the former Omega property rather than over a larger portion of the site.

Well OW1A goes dry when purged during groundwater sampling; consequently, shallow on-site wells may yield less than the estimated 0.3 gpm. The submersible electric pumps would have to operate in a pulse mode and will require a sump to maintain head above the pump. Pulsing also increases the amount of fines accumulating in the well. Pneumatic, positive displacement pumps operating in a constant drawdown mode would be more efficient and easier to operate. Such pumps adjust cycling rate with the changing well yield while maintaining a constant

water level inside the well. They are specifically applicable to low-yield formations (capacity 0-9 gpm) such as the shallow aquifer beneath the former Omega property.

An example plot of the time-varying extraction rate for a single well pumping at a constant drawdown of 10 feet, saturated thickness of 20 feet, horizontal hydraulic conductivity of 0.6 ft/d (i.e., the same conditions assumed in App. D), and assumed vertical-to-horizontal hydraulic conductivity ratio of 0.1, specific storage of 1.0×10^{-5} , and specific yield of 0.25 is shown in Attachment 1. The flowrate is still about 0.6 gpm after one year of pumping. Note the effect of the delayed yield during the first day of pumping that may resemble a "steady state" during pilot testing. The pumping rate would be lower for an extraction well operating within a well field.

As an alternative to an AOP process based on ozone/H₂O₂, the use of an AOP process based on UV/H₂O₂ should also be considered for this application if the water transmissivity is acceptable.

Provide the basis for using two 250-pounds granular activated carbon (GAC) vessels. (NOTE: This comment also applies to the other 2 alternatives as well, regarding the basis of GAC quantities specified.)

Depending upon the amount of residual H₂O₂ in the treated water and its disposition, the need for catalytic carbon for removal of H₂O₂ to acceptable levels may have to be considered, especially if surface water discharge under NPDES requirements envisioned.

App. D: The review commends the use of Mathcad because the calculations are easy to follow.

The Theis function is not applicable for the drawdown inside a pumping well; use Papadapulos and Cooper (1973), Moench (1997), or Lee (1998) functions for drawdown in the pumped well (the latter two are for an unconfined aquifer).

The effective porosity instead of storativity should be used in the integration on page 4. For comparison, a simple calculation of a cylindrical aquifer volume (ignoring the drawdown and assuming the pre-pumping saturated thickness of 20 feet) for 60 days of pumping and porosity of 0.1 results in a radius of the impacted zone of 27 feet (which is close to the radius of 30 feet used in App. D). The calculation is sensitive to the assumed value of effective porosity. For example, if the effective porosity is increased to 0.2, the radius of the impacted zone decreases to 19 feet. More wells or longer pumping would be required if the effective porosity is higher than 0.1. The design basis should account for a range of parameters.

13. Section 4.1.2, 4.1.3: Provide the basis for using two 500-pounds carbon vessels.

Show locations of proposed monitoring wells. The effectiveness of in-situ degradation under Alternative 3 should also be monitored.

Provide the basis for decreasing the system operation to 20 years under Alternative 3; this seems overly optimistic.

14. Section 4.1.3: What head will be maintained in the injection trench?

The cost of the enhanced anaerobic biodegradation (EAB) is high. This alternative should be considered in combination with the on-site soil treatment to reduce overall costs.

Future on-site soil treatment alternatives may perhaps include a soil vapor extraction scheme (SVE), which facilitates subsurface aerobic VOC degradation processes, which, in principle, are incompatible with anaerobic processes. This potential conflict of remediation schemes should be considered in the evaluation of alternatives in this EE/CA.

15. Section 4.2: The list of evaluation criteria includes implementability. It is recommended that this specific criterion be expanded to address the integration of these EE/CA alternatives to other potential future remedial actions such as SVE, for example. Future on-site soil treatment alternatives may perhaps include a soil vapor extraction scheme (SVE), which facilitates subsurface aerobic VOC degradation, which, in principle, is incompatible with anaerobic processes. This potential conflict (or consistency) of remediation schemes should be considered at least qualitatively as an implementability issue in the evaluation of alternatives in this EE/CA.
16. Section 5.1, 1st par.: Replace "optimizes" with "increases". Discuss Alternative 1.
17. Section B.1.1, EPA and CalEPA Maximum Contaminant Levels. Sentence 3: "However, chemicals that exceeded MCLs but did not exceed concentrations in groundwater that are protective of indoor air are not included as COPCs for evaluation of potential air pathways (vapor intrusion)" appears to be internally inconsistent. It is recommended that it be clarified or deleted. All volatile COPCs should be evaluated for potential indoor vapor intrusion.
18. Section B.1.2, Environmental Screening Levels. The SF RWQCB ESLs (Environmental Screening Levels) are a compilation of screening values intended for use only at sites overseen by that agency (see Cal EPA, "Use of California Human Health Screening Levels in Evaluation of Contaminated Properties", January 2005; Page V.). For that reason, it is recommended that this Section be removed from the report.
19. Section B.1.3, EPA 2002 Guidance Target Groundwater Concentrations. Excess lifetime cancer risk values should be compared to the actionable risk level for Superfund sites of 1×10^{-6} . Risks exceeding this value require a risk management decision. The risk management range that is generally used by EPA is 10^{-6} to 10^{-4} excess lifetime cancer risks. Excess lifetime cancer risk values within or exceeding this range require a risk management decision by EPA that includes evaluating site-specific characteristics and exposure scenarios to assess whether remedial action is warranted. (In Table B-3, it is recommended that the maximum detected concentrations in groundwater should be compared to a target risk concentration of 10^{-6} (one in a million)).
20. Section B.1.5, Frequency of Detection. The criteria used for screening out of potential chemicals, if any, needs to be clearly stated/clarified. It is recommended that any chemicals that are screened out be identified in a list or table, along with the screening criteria applied for each chemical. If, as stated in Section B.4.1 and B.4.2, no chemicals were screened out, this should be stated/clarified.

21. Section B.4.1, Cancer Risk. Paragraph 2, regarding the sentence reading: "Commonly, risks (or odds) of developing cancer of one to 10 in one million (1×10^{-6} to *sic* " 10×10^{-5}) or less are considered de minimus." It is recommended that the sentence be changed to read: "Commonly, risks of developing cancer of one in one million (1×10^{-6}) or less are considered de minimus."
22. B.5.4.1, Noncancer Hazards. For completeness, the unposted non-cancer PRG values should be obtained from the Region 9 PRG InterCalc Tables to adjust the site non-cancer hazard estimation to include all detected chemicals with non-cancer PRGs.
23. B.5.4.2, Exposure to Chemicals without PRGs. Paragraph 1, regarding the sentence reading: "Some of these chemicals are recognized as non-toxic and are essential minerals..." It is recommended that the sentence be revised to read, "Some of these chemicals are essential minerals..."
- Paragraph 2. It is recommended that the potential health risks and hazards from lead in groundwater be quantitatively evaluated.
24. B-6, Summary. Paragraph 1, regarding the sentence reading: "The total cancer risk from groundwater at the Site is 2.1, which is several orders of magnitude above the acceptable range of 1×10^{-6} to *sic* " 10×10^{-4} ." It is recommended that it be changed to read, "The total cancer risk from groundwater at the Site is 2.1, which is several orders of magnitude above the EPA risk management range of 1×10^{-6} to 1×10^{-4} ."
25. Figure B-1, Site Conceptual Exposure Model. An arrow connecting the "Groundwater" Primary Exposure Media "Box" to the "Incidental Ingestion and Dermal Contact" Potential Exposure Route "Box" needs to be drawn (Two arrows currently lead from the "Groundwater" box to Indoor Air Volatilization" box).
- A "Hypothetical Future Residential Receptor" needs to be added as a Potentially Exposed Population, with a "Black Circle" added to indicate "Ingestion of Groundwater and Inhalation of Volatiles" exposures are "Quantitatively Evaluated Exposure Pathways."
26. Figure B-2 and B-3, Cancer Risk and Non-Cancer Hazards for Phase 1A. This review recommends inserting the words "Total Cancer Risks" and "Hazard Index" before the displayed values. The values presented are much higher than those typically encountered and need to be clearly identified as risk and hazard values. Tables that show how these values were calculated need to be included, to support the values presented in these two figures, so the calculations are transparent and can be reviewed.
27. Table B-2, Comparison of Maximum Detected Groundwater Concentrations in Phase 1A Wells to EPA Maximum Contaminant Levels (MCLs) and CalEPA MCLs. Please address (and confirm) the following comments and change the listed EPA MCLs, as (if) appropriate:
- A comparison to the current EPA MCLs on the EPA Website was performed and the following EPA MCLs listed in Table B-2 could not be verified (and should be confirmed by CDM):
 - 1,4-dioxane; 3 ug/l
 - chloroform; 80 ug/l
 - chromium (VI); 14 ug/l

- A comparison to the current EPA MCLs on the EPA Website revealed the following:
 - arsenic is currently listed as 10 ug/l (as of 1/23/06)
 - sulfate (Secondary MCL) is currently listed as 250,000 ug/l.

Please address (and confirm) the following comments and change the listed CalEPA MCLs, as appropriate:

- CalDHS (California Department of Health Services) has issued Drinking Water Notification Levels (NLs) for a number of chemicals for which CalEPA MCLs have not been issued; it is recommended that the following NLs be confirmed and listed in Table B-2:
 - 1,2,3-Trichloropropane; 0.005 ug/l
 - 1,2,4-Trimethylbenzene; 330 ug/l
 - 1,3,5-Trimethylbenzene; 330 ug/l
 - 1,4-dioxane; 3 ug/l (listed in Table B-2 as an MCL)
 - carbon disulfide; 160 ug/l
 - dichlorodifluoromethane; 1000 ug/l
 - isopropylbenzene; 770 ug/l
 - manganese; 500 ug/l
 - naphthalene; 17 ug/l
 - N-nitrosodimethylamine; 0.01 ug/l
 - N-propylbenzene; 260 ug/l
 - 2-chlorotoluene; 140 ug/l
 - perchlorate; 6 ug/l
 - sec-butylbenzene; 260 ug/l
 - vanadium; 50 ug/l
- CalEPA MCL for nitrate (as NO₃); 45,000 ug/l
- Chromium (VI); 50 ug/l
- The CalEPA MCL listed in Table B-2 for chloroform; 100 ug/l could not be verified (please confirm)

28. Table B-3, Comparison of Maximum Detected Groundwater Concentrations in Phase 1A Wells to SF RWQCB ESLs and Region 9 PRGs. *Column 1* of Table B-3 lists the SF RWQCB groundwater Commercial/Industrial ESLs as a comparison standard for groundwater in Phase 1A Wells. The SF RWQCB ESLs (Environmental Screening Levels) are a compilation of screening values intended for use only at sites overseen by that agency (Cal EPA, "Use of California Human Health Screening Levels in Evaluation of Contaminated Properties", January 2005; Page V.). For that reason, it is recommended that the ESLs be removed from the table.

Column 2 of Table B-3 presents "EPA 2002 Guidance Target Groundwater Concentration...for Target Risk = 10⁻⁵". Since the EPA point of departure for risk management decisions is 10⁻⁶, and not 10⁻⁵, it is recommended that the groundwater concentrations be presented for a target risk of 10⁻⁶. The 2002, OSWER Subsurface Vapor Intrusion Guidance needs to be added to Section 7.0, References.

Analogous changes to **Table B-4** will be required, as well.

Column 3 of Table B-3 presents Region IX Tap Water PRGs (ug/l). A comparison to the current EPA PRGs on the Region IX EPA Website was performed and the following EPA PRGs need to be confirmed and changed (or Cal Modified PRGs added), as appropriate:

- 1,1-dichloroethane; Cal-Modified 2.0 ug/l
- 1,2,3-trichloropropane; 0.0056 ug/l
- 2-butanone (methyl ethyl ketone); 7000 ug/l
- antimony (and compounds); 15 ug/l
- arsenic; Cal-Modified 0.0071 ug/l
- chloroform; 0.17 ug/l; Cal-Modified 0.53 ug/l
- fluorine (soluble fluoride); 2,200 ug/l
- isopropylbenzene (cumene); 660 ug/l
- naphthalene; Cal-Modified 0.093 ug/l
- trichloroethene; 0.028 ug/l; Cal-Modified 1.40 ug/l

29. Table B-5, Screening Values of Cancer Risks from Maximum Detected Concentrations in Groundwater at Phase 1A Wells 2004-2005. Total Cancer Risks are presented as 2.1E+00. It is recommended that a clarification be offered to explain how an estimated cancer risk can exceed 1.0 (e.g. 1 in 1) and it is also recommended that this be discussed in Section, B.5, Uncertainties.
30. Appendix C: More detailed information regarding the conceptual design should be provided as backup information. Even though the design of the alternatives is still at the conceptual stage, the basis for cost evaluation and comparison needs to be provided. With regard to treatment, for example, the preliminary design criteria and performance criteria should be stated such as assumed design concentrations of 1,4-Dioxane for AOP treatment and what was the controlling contaminant in the design (was it the Dioxane, Freons, or alkenes?). Likewise, what was the controlling parameter for preliminary design of the GAC system and how was GAC usage estimated? What is the conceptual nature of the control systems envisioned (e.g. PLC based control system with remote monitoring and control capabilities vs. an essentially manual control system) and have costs been included for this part of the treatment plant? O&M costs should include an allowance for Maintenance parts, perhaps as a percentage of equipment capital costs. O&M costs should also include reagent usage for hydrogen peroxide (assume that ozone generation electrical power costs are already accounted for).

Flow from a Single Extraction Well at Constant Drawdown

